GROWING DAHLIAS FOR EXHIBITION AND GARDEN

RECEIVED
OCT 4 1957
FLORICULTURE

Volume XLV September, 1957 Number 5

COVER: *Dahlia coccinea*: first figure of the dahlia printed in England. Botanical Magazine, Pl. 762, 1804.

Office of publication: 306 E. Simmons Street, Galesburg, Illinois.

Editorial Office: Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

Published February, March, April, June, September, and November by the Board of Trustees of the Missouri Botanical Garden. Subscription price: $2.50 a year.

Entered as second-class matter January 26, 1942, at the post-office at Galesburg, Illinois, under Act of March 3, 1879.

Missouri Botanical Garden Bulletin

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INTRODUCTION

IT HAS been many years since information about Dahlia culture in the St. Louis area has been made available to the public through the Missouri Botanical Garden BULLETIN. Since the Greater St. Louis Dahlia Society is host to the 24th Annual Midwest Dahlia Conference and Show, September 28 and 29, 1957, at the Missouri Botanical Garden, bringing visitors and growers from coast to coast to St. Louis, it was decided to feature dahlias and their culture in this issue. The following members of the Greater St. Louis Dahlia Society have contributed articles: Charles DuChesne, Ray Grass, Joe Goss, Mr. and Mrs. Paul Hale, Ray Horrell, Richard Jamison, Mr. and Mrs. William Knetzer, Jerry Ludwig, Dan O'Gorman, Ralph H. Rabenau, L. W. Reiter, Russell Tilley and Rolla Zufall.

Additional cultural notes have been taken from Dahliadel Cultural Instructions, from the University of Wisconsin Extension Service Circular 544, from the Dahlia Blue Book for 1957, and from previous issues of the Missouri Botanical Garden BULLETIN.

HISTORY OF THE DAHLIA

Toward the end of the sixteenth century (1570) Philip II of Spain sent his physician, Francisco Hernandez, to New Spain (Mexico) to investigate the natural history of this country. As a result of this expedition, Hernandez published in 1615 four books on the plants and animals of Mexico in which he describes three forms of "an herb bearing leaves similar to the mountain spikenard (*Valeriana tuberosa*) which are divided into five leaflets of which some are sinuated. The flower stalks which are nine inches long are slender and smooth and the flowers pale red and stellate." The figures accompanying this description are easily recognized as a form of our well-known dahlia, although the plant had to wait 175 years for a permanent name. Hernandez called his three forms by their Aztec names, Acocotli, Cocoxochitl, and Acocoxochitl. Cocotli meant tube or hollow stem, and the native names may be translated as "water pipe," "hollow-stem flower," and "water-pipe flower," respectively.

Hernandez specifically states that there were many forms of Acocoxochitl occurring in Mexico. These differed from one another in size and color, "some white, others yellow, others purple or perhaps yellow tinged with purple, and a great many other kinds, in some cases with double or multiple whorls of ray flowers, either forming circles or clustered in compact masses."

In a work published at Rome in

1651 by Vitalis Mascardi is a figure of a double-flowered dahlia which has until recently been regarded as an evidence that at this early date cultivation by florists had resulted in this change from the single to the double type. No further record of the plant is to be found until 1787, when a Frenchman, Nicholas Joseph Thiery de Menonville, was sent to America for the cochineal bug. He speaks of dahlias seen in a garden near Guaxaca which had large aster-like flowers, stems as tall as a man, and "leaves like those of the elder tree."

In 1789 the director of the botanical garden at Mexico sent seed to the Royal Gardens at Madrid. The Marchioness (of Bute) obtained some of these seed and cultivated the plants in her English greenhouse. While not particularly successful she disseminated seed to various correspondents, including most of the botanical gardens in Europe. By 1803, an English nurseryman, John Fraser of Sloane Square, had

First figure of the dahlia ever printed, from the "Nova Plantarum Animalium Mineralium Mexicanorum Historia" of Francisco Hernandez, 1615.

flowered *Dahlia coccinea* (a single form) in his greenhouse, and this plant was the subject of the first picture to be printed in England, appearing in the "Botanical Magazine" in 1804.

The director of the Madrid garden, Abbé Cavanilles, named the plant, seed of which was sent from Mexico, in honor of André Dahl, a Swedish botanist. Cavanilles recognized two species, *Dahlia pinnata* and *D. coccinea.* The seedlings from *D. pinnata* were so various that it was renamed *D. variabilis*, but according to the rules of nomenclature the latter name cannot stand. The same can be said of *D. rosea*, which is simply a synonym of *D. pinnata.* The many varieties of dahlias with rounded compact heads, looking so artificial, are descended from this species. *D. cocinea* does not cross with other species and retains the simple habit. The color varies from scarlet to yellow or brownish red, never verging on pink or crimson.

About 1863 there was sent to Europe from some unknown locality in Mexico a single hybrid plant growing in cultivation, afterward named *Dahlia juarezii*, which was the origin of all the varieties now known as cactus dahlias or hybrid cactus dahlias. It bloomed for the first time in 1864 and was figured in the "Gardeners' Chronicle" in 1879. It was not until October 21, 1916, however, that the ancestral wild form of *D. juarezii* was discovered by Wilson Popenoe in Guatemala. This proved to have a single row of eight long spreading crimson rays turning backward along the margin, and was named by Safford *D. popenovii.*

By 1814, the dahlia was established in England and France, and Erfurt and Leipzig, in Germany, and the Hague, in Holland, were noted centers for its cultivation. The "Annual Dahlia Register," one of the first publications of its kind, appeared in 1836, and we find it filled with advertisements of dealers in dahlias, the prices per plant ranging from five to twenty-one shillings.

As we now know, double forms of the dahlia were well known to the Aztecs who domesticated the wild dahlias of the mountains of Mexico and Guatemala before the discovery of America. It was not until 1814, however, that a double variety was obtained by Donkelaar at Louvain, and as has been said, it is generally believed that the double dahlia is the result of modern selection and cultivation.

The original wild species, *D. pinnata*, gave rise to the so-called "show" or ball-shaped formal flowers. From this there was developed in France the "fancy" type. The "decorative" dahlia is believed to be the result of a cross between the "show" and "cactus" varieties, differing chiefly from the typical "cactus" in its strength and more profuse blooming. The "pompon" or "bouquet" type is of German origin, dating back to 1808, when Hartweg obtained it from the single-flowered *D. coccinea.*

It is extremely difficult to trace correctly the introduction and development of the dahlia in America. Apparently, however, it was not many years after the culture of this plant was established in England that a few growers on the Atlantic coast began to

Dahlia yuarezii: crimson. Gardeners' Chronicle, Oct. 4, 1879. p. 433.

experiment with it. The first book and probably one of the very first publications on the dahlia in the United States was by E. Sayers. This was printed in Boston in 1839 under the title "Treatise on the Culture of the Dahlia and Cactus." (available in the Garden library) . . . Seedsmen's catalogues about 1860 began to publish lists of dahlias.

The first American Dahlia Society, which is not to be confused with the existing American Dahlia Society, founded in 1916, was organized at the Hotel Hanover, Philadelphia, March 20, 1895.

—from THE MISSOURI BOTANICAL GARDEN BULLETIN. September, 1929. Vol. XVII, No. 7

In the middle nineteenth century the show dahlia, or ball type as it is now called, was the most popular variety. The introduction of *Dahlia juarezii* reawakened interest which had lessened during the 1860's, and in the 1880's the small varieties enjoyed a season of popularity.

Since then interest in dahlias has grown steadily, not only in the United States, but all over the world. Dahlias are available in practically every color except pure blue; and in sizes varying from pompons less than an inch in diameter to giants as large as 14 or 15 inches across. More than a dozen distinct forms are recognized, occurring in nearly every size classification. Today's favorites are truly cosmopolitan, ranging from American varieties such as "Mrs. Hester A. Pape," "Ceramic Beauty," and "Surprise," to the Coydon varieties from Australia, "Mushashi" and many others from Japan, the incomparable dark red cactus "Juanita" from South Africa, Ballego's many introductions from Holland, and thousands of others from Germany, Italy, Czechoslovakia, France and England.

As dahlia popularity has grown, so have the dahlia clubs and societies. Some are subdivisions of general gardening clubs, others specialize in dahlias alone. Many are regional or statewide in membership. The American Dahlia Society has members all over the United States, working together to exchange cultural information so that all might improve their growing methods.

The St. Louis Dahlia Society was organized February 11, 1939, with Mr. Ed Nolte serving as the first president. Through the years the membership has grown, and the fall show, usually held the last weekend in September, has always been one of the most popular attractions of the year at the Missouri Botanical Garden.

TYPE CLASSIFICATION OF EXHIBITION DAHLIAS

Dahlias are composite flowers belonging to the Family Compositae or the Sunflower Family. In this family the flowers which make up the head (a single bloom) may be of all one kind, either strap-like ray flowers or tubular disc flowers; of two kinds, usually disc flowers surrounded by ray flowers; or of combinations involving various modifications of disc and ray flowers.

The various forms of the Dahlia have been classified for the benefit of growers and exhibitors by the Joint Classification Committee consisting of

DAHLIA TYPES

Peony
Single
Pompon
Collarette
Miniature Formal Decorative
Informal Decorative
Cactus

five members from the American Dahlia Society and five from the Central States Dahlia Society.

The size divisions are: "A"—large, over eight inches in diameter; "B"—medium, six to eight inches in diameter; "BB"—intermediate, four to six inches in diameter; "M"—miniature, under four inches in diameter. Exceptions to these groups are the pompons, which must be under two inches; and the miniature ball dahlias, two to four inches in diameter.

Single Dahlias: Open-centered flowers, with only one row of ray florets (a floret is a small flower), with margins flat or nearly so, regardless of the number of florets. For example: "Candlelight."

Orchid-flowering Dahlias: Flowers as in Single Dahlias excepting that the rays are more or less tubular by the involution of the margins. "Dahliadel Twinkle."

Collarette Dahlias: Open-centered flowers, with only one row of ray florets, with the addition of one or more rows of *petaloids*,* usually of a different color, forming a collar around the disc. "Erica."

* Modified ray florets (?). (A distinction made by the Joint Classification Committee but not clearly defined, italics mine, Ed.)

Anemone Dahlias: Open-centered flowers, with only one row of ray florets, regardless of form or number of the florets, with the tubular disc florets elongated, forming a pincushion effect. "Vera Higgins."

Peony Dahlias: Open-centered flowers with two to five rows of ray florets with or without the addition of smaller curled or twisted *floral rays** around the disc. "Pink Lassie."

Incurved Cactus Dahlias: Fully double flowers, with the margins of the majority of the floral rays fully revolute for one-half or more of their length and the tips of the rays curving toward the center of the flower. "Oakleigh Champion."

Straight Cactus Dahlias: Fully double flowers, with the margins of the majority of the floral rays fully revolute for one-half their length or more, the rays being straight, slightly incurved or recurved. "Edna D."

Semi-Cactus Dahlias: Fully double flowers, with the margins of the majority of the floral rays fully revolute for less than half their length and the rays broad below. "The Cardinal."

Formal Decorative Dahlias: Fully double flowers, with the margins of the floral rays slightly or not at all revolute, the rays generally broad, either pointed or rounded at tips, with outer rays tending to recurve and central rays tending to be cupped; and the majority of all floral rays in a regular arrangement. "Five Star General."

Informal Decorative Dahlias: Fully double flowers, with the margins of the majority of the floral rays slightly or not at all revolute, the rays generally long, twisted or pointed and usually irregular in arrangement. "Glamour."

Ball Dahlias: Fully double flowers, ball shaped or slightly flattened, floral rays blunt or round at tips and quilled or with margins involute for more than half the length of the ray in spiral arrangement, the flowers 4 inches or more in diameter. "Alice J."

Miniature Dahlias: All dahlias which normally produce flowers that do not exceed four inches in diameter, pompons excluded, to be classified according to the foregoing descriptions.

Pompon Dahlias: Having same characteristics as Ball Dahlias but, for show purposes, not more than two inches in diameter. "Little Edith."

Dwarf Dahlias: Term that applies to plant size without regard to the characteristics of the blooms.

There were fifteen color divisions listed in the 1953 classification list; the colors ranging from white through yellows, reds, and purples, in combinations, blends, and variegations.

—from the 1953 Classification of Dahlias

DAHLIA PROPAGATION

Root Divisions

"Dahlias are most commonly reproduced by dividing the clumps of tuberous roots in March or April. You can usually see buds or "eyes" on the crowns at this time. If not, place the clumps in a warm, moist room for several days to make the buds show up. Then separate the clumps with a sharp knife into sections with one bud and one or two roots each. Discard damaged roots and those without buds."

After danger of frost is over, set the tuberous roots 4 to 6 inches deep, depending on the soil type. Use the deeper planting on light sandy soils, and the shallow planting on heavy clay soils.

—University of Wisconsin, Extension Service

"For the amateur, clumps are better partially divided in January or February. Trim out any portions of crown or roots that show decay. On early dividing it is not advisable to cut apart to single root divisions, but rather divide a clump into two to four pieces, leaving two or more roots to a division. These can be again divided at planting time as long as you have one good eye with each root. Dip cut portions in Dahliadel Dip and repack as before. When dividing clumps, tagging each division becomes quite a chore, also these tags must be removed before planting. It is therefore less work to wet the root with a sponge or rag and mark either name or number right on the root with an indelible pencil. This will not come off when packed in vermiculite or even during a growing season in the ground. Let roots dry in air before repacking in vermiculite."

—Warren W. Maytrott in Dahliadel

I take clumps of roots out of storage about April 15th and after dividing them start the buds in a cold frame covered with a good-fitting sash. Gently slope the soil in the coldframe and place a plastic cloth on it. Then place the root sections close together in a horizontal position and cover with about three inches of sand. As soon as shoots appear, move sections to another identical frame and space three or four inches apart. Let the shoots grow to five or six inches in height before planting them in the garden. While in the cold frame, plants should be sprayed with insecticide and liquid fertilizer at about 10-day or 2-week intervals. Keep the cover on only when the temperature drops below 45°, or to keep out excessive moisture; however, the sand must be kept moist. The plastic cloth keeps the roots from growing into the ground and induces them to fan out as you would like to find them when you dig up the roots at the end of the season.

Cuttings

Sooner or later the real dahlia enthusiast becomes interested in increasing the number of plants of a variety that he particularly likes. A root clump usually gives from three to five divisions with good, live buds; but the exhibition grower who wins ribbons for "best vase of ten or fifteen blooms, same variety" must have not less than ten plants from which to choose those blooms. To obtain more plants than root divisions will give, the grower resorts to cuttings (that is, the successive cuttings of the sprouts that grow from the buds on the tubers), which after being rooted, are potted up, providing growing green plants for setting out in the field or garden.

This additional increase is not the only reason for growing plants from cuttings. The use of cuttings makes it possible to plant the patch with young plants of uniform size, which makes timing for the show much easier. Also it has been the experience of many growers that good green

plants will start off much more vigorously than plants from roots, and are much less subject to the dwarfed or stunted condition sometimes found in plants grown from root divisions. Moreover, it is possible for the commercial grower to offer green plants of new varieties at about half the price of root divisions.

"Dahlias can be multiplied quickly by cuttings taken in late winter. To develop cuttings, plant roots indoors in large containers or in a greenhouse bench in January. Place the crown just below the surface of the soil. Use a soil containing one part each of sandy soil, peat moss, and sphagnum moss. Provide full sunlight and maintain a 60° temperature.

"As soon as the third set of leaves has developed, cut off the shoots at the soil surface. Place these cuttings in coarse sand or vermiculite, and leave them until they form roots—about 3 to 4 weeks. Place them in a shaded location and keep the sand or vermiculite uniformly moist. If the plants become too large for their containers prior to setting outdoors, transplant them to a larger pot."

—University of Wisconsin,
Extension Service

In a Home Window: Enough dahlia plants for the average garden can be easily grown from cuttings in a sunny window at home. A southeastern exposure will provide the essential sunshine. Four boxes, two of them 8 inches deep for the roots and the other two 4 inches deep for the cuttings, should be made to fit the space to be used. It is well to keep the size of the boxes small enough to be handled easily, since a large container when filled with roots or cuttings in moist sand or peat moss would be too heavy to move easily to the work bench. Place boxes on a sturdy bench or table at sill level in front of the window. Since the bench and boxes will be a part of your living room furniture for a few months it is best to provide neat and well-made equipment.

The production of shoots and rooted cuttings will be fast at normal room temperature and therefore it will be unnecessary to start the roots before the last week of February. It will be necessary to have enough good cold-frame space available to care for early plants. Select firm, small- to medium-sized roots if possible (large roots use much space without producing any more cuttings). Insert roots vertically into damp peat moss in the deep boxes, leaving the crown at or slightly above the level of the moss. Label each root or group as planted. Pack the peat moss firmly and water thoroughly, allowing excess water to drain through the boxes before placing them in position in front of window. Fifty or more different varieties can be started in two boxes 12 × 22 inches. In about two weeks shoots will appear on the crowns of the roots. When these shoots are about two inches high they should be cut off leaving a trace of the new growth attached to the crown. New shoots will then form around the old one and these may then be broken off without damage to the eye. Insert cuttings about 1 inch deep in the shallow boxes which have been filled with a mixture of ½ sharp sand

and ½ peat moss by volume. 100% sand is good as a rooting medium but the peat moss keeps down the weight of the filled container making it easier to handle and it is just as good as sand.

Mark cuttings with a label, pack the sand and peat moss firmly about the stem and then water thoroughly. The boxes containing the cuttings should be placed nearest to the window to get the most sunlight. In about ten days or two weeks roots will have formed on most varieties. These can be removed carefully and potted in 3½- or 4-inch pots using good loose potting soil. Keep partially shaded for three or four days until established and then place in a cold frame until time to plant in the garden. Keep the young plants cool, but free from frost, well ventilated and in as much sunlight as possible. It is very important that the root stock and the cuttings be kept moist at all times. Liquid fertilizer applied weekly to the peat moss around the roots will help to keep the later cuttings as strong and healthy as the first ones. Several hundred young plants can be propagated in this manner without too much mess in the home if reasonable care is exercised in watering and handling the boxes.

In a Garage: The patio portion of my garage is 6 × 16 feet and has a wall on the south and west the lower portion of which is concrete blocks (four blocks high) and the upper portion common window sash. Benches were constructed using corrugated transite for the beds and flat strips of transite six inches high for the sides, assembled with aluminum strips, bolts and nuts. The legs are concrete blocks. A thermostatically controlled heater is used during the cool weather to maintain a minimum temperature of 55°. The two windows on the south end are kept open as often as possible. Fresh air and sunshine are believed to be the controlling factors resulting in a loss of less than one percent of the cuttings during the past season.

A three-inch base of damp sphagnum moss was laid on a section of the bench having a southern exposure. Here the roots were placed and packed with additional damp sphagnum, leaving a sufficient amount of the root crown exposed to enable easy removal of cuttings. The sphagnum should be kept moist. Shoots will begin to appear on the roots after about ten days.

The section of the bench employed for cuttings contains a base of 1½ inches of torpedo gravel with four inches of coarse, clean sand on top. Drainage, so important to the cuttings, is almost perfect, since moisture settles to the gravel and runs out the end of the bench. Cuttings should be dipped in a hormone powder, such as Rootone, and placed in the sand an inch to an inch and a half deep. Water thoroughly. If cuttings wilt the first day or two some shade should be provided. Cuttings should root in 10 to 30 days. Transplant in 4-inch pots or 3-inch bands. A potting soil consisting of one part black or neutral peat moss, one part dried cow manure, one-half part sand, and three parts garden loam has been the most successful mixture I have used. When potted and watered, the rooted cuttings are placed in a shaded area for 24

hours and then put into the cold frame.

Some points that should be kept in mind—roots, cuttings and plants should always be watered thoroughly but never left standing in water; ventilation is a necessity; propagating should be on the cool side for strong firm growth. Keep the area clean, as a cluttered dirty area provides an excellent place for disease and insects to breed. Lastly, do not neglect your cuttings—a check in their growth could ruin all chances of a strong healthy dahlia plant.

In a Greenhouse: Our greenhouse, which measures 6 × 12 feet, is fastened to the house and is heated by raising the windows leading into the house. For propagating the dahlias we use boxes 10 × 16 × 4 inches—a size easily moved from the greenhouse shelf to the potting bench. Roots with definite buds "eyes" are always used; this eliminiates wasted space with blind roots. They are placed in moist pure peat moss which is soft, easy to handle and light to lift. Cuttings are made when shoots are two and a half to three inches long. Smaller shoots will root faster than big ones that are sometimes hollow. The first shoot from a bud is cut off with a sharp knife; the later shoots can be "wiggled" and broken off.

We use a good, clean, sharp sand in which to place cuttings to root. We have tried rooting hormones but have discontinued using them because we prefer two or three good husky plump roots or root "knobs" on the cutting rather than the mass of fine hairy roots produced on treated cuttings.

A sprout being "wiggled" or broken off.

Two or three roots at the start make a better root clump to harvest in the fall. Thoroughly soak the sand in the bench and with an ordinary lead pencil, flat end down, make 1½-inch deep holes in the sand. Carefully *bottom* the cuttings in the holes and then firm the sand around them. It is essential to put the cuttings into the sand as soon as possible after they are cut. Although cuttings root faster with bottom heat, they also grow faster and get "leggy" much more quickly. Without bottom heat the cuttings form roots in two to three weeks ("Freda Gaylord" takes longer) and are short, stocky, and dark green. Watering the foliage and sand each morning with warm water as the temperature is rising is most important.

Placing cutting in sand for rooting.

Never water tender cuttings with cold water, especially when the temperature is dropping. We keep a tank filled with tap water to warm to room temperature for use in watering. Once a week the cuttings are watered with liquid fertilizer which is made up a little more dilute than the instructions recommend and mixed in the water warming tank.

New, green leaves are a positive indication that roots or at least root "knobs" have formed. We mention root knobs because we are sure that most growers have pulled a cutting from the sand and noted that instead of roots only little bumps or knobs had formed near the base of the cutting. We pot these because they keep right on growing in the potting soil and actually make a better formed root. Sometimes a cutting will be overlooked in the sand and finally when it is found and removed it will have roots several inches long. These long roots are very hard to transplant and we believe they tend to make poorly formed root clumps in the fall. Further proof that cuttings have rooted may be had by gently grasping the cutting and giving it a tug. If it seems to hold fast to the sand we know it is ready to take out and transplant to 3 × 3 × 3 in. plant band. We use nutrient treated bands that are uniform in size and fit together when placed in the cold frame, conserving space and moisture. Each tray holds 16 banded plants and has 16 holes drilled in the bottom to allow drainage for each plant. Ordinary garden soil is used in the bands. The soil is firmed around the rooted cutting carefully and watered heavily. After the first heavy watering the plants are grown on the dry side. The drier the soil the easier it is to handle individual plants. Too loose or porous soil will shatter from

the band; ordinary soil when dry forms a solid block.

We've found that these tender plants need a few days protection so they can recover from the shock of transplanting before they are moved to the cold frame. The transplanted cuttings are placed under fluorescent lights beneath the sand bench for 2–3 days then moved to the coldframe. We use unheated cold frames and nearly every year are forced to string long extension cords and light bulbs to the frame to keep the temperature just above 32 degrees. We do not shade; and we keep the covers off the cold frames as much as possible. Plants hardened off in this manner never show signs of shock or wilting when they are transplanted to the garden.

Last season our little "poor man's" greenhouse rewarded us with 1500 fine plants. We heartily recommend a small greenhouse to all gardeners.

Under Fluorescent Light: I have my propagating bench in the basement where the temperature is around 50° to 55°. The bench is 30 × 96 × 4 inches, and is 38 inches off the floor, built of 2 × 4's on angle iron legs. In the bottom of the bench is a heating cable connected to a bulb thermostat which is set as 60°. Above the bench are two 48-inch fluorescent lights each with two 40-watt bulbs (the type you can easily buy around buildings that are being remodeled or from electrical contractors). The lights are suspended by chains running through pulleys and counterbalanced with sash weights so they may be easily raised and lowered. A mixture of soil, sand, and peat moss in equal parts by volume is placed in the bench. Here the roots are placed leaving the crown well above the soil to make it easy for taking off the cuttings.

We start our roots in February because there will always be some that are very dry compared to others and much more time will be required for them to bud out. We find the ideal planting time in this area to be about May 15 and we always have nice plants ready by that time.

A method of propagating dahlias by cuttings under fluorescent lights which I have found very satisfactory is that suggested by the Grow Quick Sales

Company for the propagation of African violets.

Build a bench 5 × 2 feet with four shelves about 14 inches apart. Under each of the three upper shelves, place two fluorescent 40-watt lamps. On the bottom shelf place a heating cable. The bottom shelf is used for the roots which are placed in a mixture of about three-fourths peat moss and one-fourth good top soil and a little well-rotted cow manure. The cuttings are placed on the shelf above in pans containing 2 inches of small gravel and 2 inches of Meremac sand. After cuttings have rooted (from two to five weeks) they are put in 4-inch pots, left under the lights for another two weeks on the upper two shelves and then set out in the yard in a coldframe to harden off.

In order to control the lights and heat, I used a cable with a thermostatic control and a clock which turned the lights on and off automatically. I found that light from noon to midnight was sufficient.

Seed

One of the most interesting phases of dahlia growing is the raising of plants from seed taken from exhibition varieties. This seed can be purchased from nurseries that specialize in dahlias. Most of it is harvested in California where the climate is ideal for the production of seed.

Much of the fascination of growing seedling dahlias is the anticipation while watching them develop of viewing the first bloom. Since the varieties do not reproduce true to type from seed, each seedling plant grown will be different even though the seeds all come from the same flower head. All of the new varieties seen on the exhibition tables each year were once seedlings with the rare exception of those that developed as sports on another variety. Thus each seedling grown is a potential new champion—although the odds have been figured at approximately 1,000 to 1 against any one seed producing such an outstanding plant. However, the possibility is always there to add interest and suspense to the season.

In the vicinity of St. Louis, dahlia seed should be started indoors around the middle of March. A heated sunporch or a sunny window make suitable locations if no greenhouse is available. The seed can be sown in small flats of any size convenient to handle. They should have a depth of approximately three to four inches. A mixture of two parts soil to one part each of peat and sand should be used for planting the seed. No fertilizer is needed as the seedlings remain in the flat only a short time after germinating. The planting mixture should be sterilized for best results. A simple way to accomplish this is to put the mixture in an old dishpan or pot and heat in the oven for one hour at 250°. This treatment kills harmful organisms and any weed seeds that may be present.

When the sterilized soil has cooled, fill the flats and pack firmly with a block of wood. Place another quarter-inch of soil over this, level it, but do not pack. Make rows for the seed by pressing the edge of a pot label or a rule into the surface, making shallow depressions 1½ to 2 inches apart. Sow the seed about 1½ inches apart within

the rows. The seed is then covered, preferably with a thin layer of vermiculite or finely sieved sphagnum moss to avoid surface caking. The soil is then gently watered with a fine sprinkler to avoid washing out the seed. A covering of several thicknesses of newspaper or a pane of glass over the flat will help to retain moisture until the seed has germinated. A temperature range of 65 to 75 degrees should promote rapid germination. Examine the flats daily to be sure they do not dry out. When the seedlings begin to break through the surface, usually in four to five days, the covering of glass or newspapers must be removed and the flats placed where they will get plenty of sunlight.

When the seedlings have developed their first set of true leaves they can be transplanted. If placed into 3½- or 4-inch pots or plant bands they can be left there until ready to be planted in the field. After transplanting the plants should be kept out of the direct sunlight for two or three days, and then placed out in a coldframe. If kept inside too long the plants tend to get tall and spindling. Plants can be placed outside under a tree or near the wall of a house if no coldframe is available. When frost is predicted they must, of course, be brought inside since they can not be covered as if in a coldframe.

The dahlia seedlings are ready for field planting as soon as danger of frost is past. Sometime around the middle of May is a good time for planting out in the vicinity of St. Louis. Once in the garden they should be handled the same as any other dahlia plant. Be especially careful to spray them regularly; many a promising seedling has become infected with disease in its first year through carelessness in this respect.

Watching the seedlings grow and develop through the season is full of interesting surprises; and, when the buds begin to form, the anticipation and expectation makes daily inspection a must! If you want a new thrill from growing dahlias, try some seedlings.

DAHLIAS AS GARDEN FLOWERS AND BORDER PLANTS

Dahlias are among the most popular of show flowers in America. They ask for comparison and fear no competition. Maybe this is one reason why so many people neglect to grow dahlias as garden flowers. Only a few of our public parks display large borders and plantings of dahlias. It is my belief that gardeners of such institutions should be encouraged to plant more and more dahlias.

Modern dahlias are for modern people—for busy people who have little time for gardening, but who appreciate a fine show of color in their home garden. A bed or border of small-type dahlias costs very little and is no trouble to grow. During the warm months of the year these small beauties will produce a fine show of flowers that are remarkably free from disease.

Few garden subjects look better in the mass formation and the lucky gardener who has a fairly large plot can have bold drifts of color in beds and borders of just about every color except blue.

By using the dwarf types "Bonny

Otto Bergerhoff Gardens, Cologne, Germany.

Esperance," "Kokette," and "Snow White," along with the giants, a person can arrange a border with three bands of plants—tall at the back, medium in the middle and dwarfs in the front. Don't place them in definite rows like soldiers, but, taking care that the miniatures are not hidden, vary the arrangement by slipping in a tall variety here and there. A border with a waved edge is much more attractive.

Unless we dahlia-lovers promote our "first love" by planting borders, our neighbors may go on for years being dissatisfied with their gardens. No single garden improvement can equal a really large planting of bedder type dahlias. Nothing can add more brightness and beauty to an ordinary home garden, nothing else will give such lavish color, such commanding beauty for so little trouble.

With all the varieties of dahlias now available to the home gardener, the dullest most ordinary type of garden can be made into something that will be the envy of your neighbors.

A great number of people are not happy with their gardens and this isn't surprising because most of us started with limited experience when it was hard to visualize the plants and colors we really wanted. After a season or so the new gardener realizes he wants something more than just a trim lawn. It is at this point we dahlia lovers should convince our neighbors that dahlias are also the answer for bedder flowers even though the general opinion of most people is that dahlias are mainly grown for exhibition.

Bedder type dahlias can be bought as seed roots or green plants; all three types produce good plants in the home garden.

PLANTING

Plant dahlias where they will receive lots of sunlight. They do well in a variety of fertile, well-drained soils, but be careful to choose locations that protect the plants from wind damage.

Spacing depends on the varieties you have. Use a 3 × 4 foot spacing for larger varieties and a 2 × 3 foot interval for smaller ones.

Planting time in the St. Louis area is about the middle of May (exhibition dahlias need not be planted until the first part of June). Tuberous roots planted directly in the soil can be put in after danger of frost is over.

For Exhibition: Dahlias planted specifically for exhibition rather than for decorative purposes require more space for each bush; and planting is usually done somewhat later to reduce the amount of pinching and pruning necessary.

An easy rule to follow in spacing show dahlias is to allow six square feet of ground area for the plant and 1 bloom, and 2 square feet additional for each extra bloom on "A" size flowers, thus plants expected to produce 4 large blooms should be spaced at least 3 feet × 4 feet apart. This same area should produce twice as many "B" size blooms of exhibition quality and size. If your plants are close together do not allow as many canes to form if you want extra size and long stems.

Since most exhibition growers set out green plants, the proper planting time for St. Louis and vicinity is between the first and fifteenth of June. Exceptionally early blooming varieties should be planted a little later and very late varieties should be set out earlier to allow at least 2 or 3 weeks in the garden before pinching, as stated in the article on timing. If planting from dormant roots, start about 2 weeks earlier, and if using sprouted roots, about 1 week earlier than green plants.

For display flowers where the development of good root stock for next year's planting is not important do not plant more than 4 inches deep, as dahlias are surface feeders. Fertilize 1½ times as heavy as ordinarily recommended and irrigate extensively. Each cane should be carefully tied to a stake to insure long straight stems with good foliage that has not been damaged by being whipped about or rubbed against neighboring canes. For exhibition purposes perfect individual canes and blooms are more important than an overall pleasing garden effect. A good mulch applied in July will help to hold moisture in the soil and control weeds.

FERTILIZING

Natural Fertilizers: Dahlias like plenty of organic matter in the soil. I like to rototill compost or other organic matter such as old straw or grass clippings into the patch in the fall, along with a little rock phosphate or bone meal and some wood ashes. In the spring I rototill again some time before planting and let ground stand, then rototill once more at planting time.

At planting time I use a handful of tobacco dust around each plant. After plants are well started I take a small quantity of rotted manure and place it

in a five gallon bucket of water, let stand a few days then give each plant about a pint of this solution. Later repeat this once or twice before blooming time.

As soon as plants are tall enough mulch with compost, leaves, old straw or hay, or any suitable material to conserve moisture. Water once or twice a week and soak ground until it is really wet, and at the same time spray the underside of the leaves with a fine mist (this takes care of red spider mites).

Chemical Fertilizers: Of the elements essential for plant growth those needed in greater quantities than available in most soils are nitrogen, phosporus, and potassium. For dahlias the best proportion of these substances is 8–20–12; and if it is not commercially available it can be prepared by mixing 2 parts of 5–10–5, 4 parts 20 per cent super phosphate, and 1 part 60 per cent muriate of potash. Using one pound to 100 square feet put fertilizer into the soil in the fall or early winter and again in the spring about four weeks before planting time. Also in the spring four weeks before planting time put into the soil one pound of ammonium sulphate to 200 square feet of soil. Late in the summer a side dressing of the 8–20–12 fertilizer may be worked well into the soil about a foot away from each plant, then watered thoroughly.

If a liquid fertilizer is used start in the spring about two weeks after the plants have been established in the soil with a spray of 1 teaspoonful of 20–20–20 fertilizer to one gallon of water and apply about one quart per plant to the leaves once every week or ten days for the entire season.

STAKING AND PRUNING

All dahlias should be staked, especially if grown for exhibition. Staking is done to protect the plants from blowing over in storms, and also to keep the branches under control. Many varieties tend to grow in a widely spreading manner; to assure straight stems they must be closely tied to the stake. Stakes at least six feet long and one and a half inches square should be driven beside the hill to a depth of 12–18 inches. Cypress will outlast other woods for stakes but it is difficult to get at times and other woods treated with wood preservative are serviceable. Steel reinforcing rods or small diameter pipe cut to proper length can also be used and will last indefinitely.

The management of the growing plant is one of the most important factors in the production of top quality exhibition dahlia blooms. Such management begins at the time the plant has been in the field long enough to produce three or four sets of leaves. At this time the growing center of the plant is pinched out or cut off, just above the third set of leaves in the large "A" size dahlias, and above the fourth set of leaves for the medium "B" size. A short time after this is done a small lateral branch will begin to grow at the junction of each leaf and stem (the leaf axil). Thus the plant with three sets of leaves will develop six laterals and the one with four sets of leaves, eight laterals.

The two top laterals that develop on the "A" size plant are pinched out when very small so that it will develop only four branches. This is done to insure good sized blooms. Some growers reduce the amount of branches still further, but in good soil intelligently fertilized, a dahlia plant should easily produce four top-sized, good quality blooms for the show. The "B" size dahlias can be allowed six or eight branches since most varieties will attain sufficient size to win in their class.

It is important as the laterals develop to keep them trimmed of all excess growth. Some varieties tend to make many excess side branches; these must be removed and the plant kept to the four or six main stalks that we want it to have.

The first blooms of the dahlia are usually the largest so when growing for exhibition it is essential that all buds that form sooner than one month before the show be pinched out. When this is done one of the small laterals that develops at the next set of leaves below the bud is allowed to grow. It will produce the next set of buds, and if still too early the above procedure is repeated. Approximately thirty days (see Timing) before the show, pea-sized buds are allowed to develop for exhibition.

The above methods are not followed in the case of small varieties such as miniatures and poms, which are allowed to grow as many laterals as possible since profusion of blooms is wanted to keep them under the maximum size limit.

TIMING

"I had a better bloom than that blue ribbon winner in my garden last week," is a remark often made by viewers at Dahlia Shows. Last week's flower however, will never win a blue ribbon. The successful exhibitor knows that growing the prize-winning bloom is only part of the job—having it ready at showtime is an equally important part.

The goal in controlling flowering time is not, as many believe, to have practically every dahlia in the patch in full flower at showtime. This would be a difficult and risky thing to attempt since each season varies in rainfall, temperature changes, etc., all of which affect the length of time it takes a dahlia to bloom. The real goal in timing is to blanket the show date, allowing for the early, the normal and the late season. In this way a good proportion of blooms for the show is assured, regardless of the weather.

The method of timing most used in the Midwest is known as the "Double Pinch" or "Double Cutback". The first pinch is made when the young plant has three or four sets of leaves (as described above). The second pinch or cutback is made at a time determined by the date of the show. This time will vary depending on soil type and whether or not the patch is in full sun or part shade. In a dahlia patch in full sun a lateral will take fifty days after being cut back to mature a flower. This applies to most "A" size blooms—"B" size flowers especially of the cactus type will mature from five to seven days sooner. A patch that has part shade will require

55 or even 60 days to produce mature blooms from cutback. Experimentation is the only way to ascertain how to time the dahlias in your patch. Remember one thing—it is far better to cut back too soon than not soon enough. A plant cut back too early can still be made to produce blooms for the show by timing with the buds, but one cut back too late will not produce buds soon enough.

In order to blanket the show date as mentioned above, the following procedure is used. Assuming that timing is being tried for the first time, and remembering that it is better to cut back too early than too late, 55 days should be used as a cutback figure. First, take your calendar and count back 55 days from the date of the show. For example, if the show is on September 20 counting back 55 days gives July 27 as the day to cut back. Blanketing that date, five more days are counted back to July 22, and one cane from each plant in the patch is cut back on that day. Three days later another cane on each plant is cut back. Repeating this procedure twice more at three day intervals and the cutback on "A" size plants is completed. In the case of "B" size plants with six or eight laterals two canes are cut back each time. Cutting back in this way over a period of twelve days, there should be blooms for the show regardless of the weather.

The actual cutting back is accomplished with a sharp knife and a stout heart. A stout heart is needed to cut back four and five foot plants, yet they will rapidly send out new growth seemingly even more strongly than before.

The amount to cut off each plant depends on the preference of the grower. Some cut back almost to the ground, within one set of leaves of the main stalk. Others cut off just the upper two or three inches of the stem. If a plant four and a half to five and a half feet tall at blooming time is desired, cut off just enough of each stalk to leave the plant two and a half to three feet tall when cutting back is finished. Select a set of leaves on the stalk where the laterals are very small—no longer than one-half inch. Cut off the stalk at the set of leaves just above the one selected. If the cut is made directly through the node on most varieties the stem will be solid at that point and will not need to be capped. If the cut is made between sets of leaves, or if the plant is one of the few varieties that does not have a solid stem at the node, the hollow cut end should be capped with aluminum foil so that water does not collect in it. When the stalk has been cut back, any small laterals below the one selected for saving must be removed. Some of these laterals will not show up immediately and the patch must be gone over every few days to remove the unwanted laterals.

Five weeks before the show all canes should be examined for buds. Any in which the center bud is already pea size should have it pinched out and one of the side buds saved. This will delay blooming about five days and should hit close to the show date.

Plants showing buds the size of a small pea or a BB shot thirty days before the show are well timed. The two side buds should immediately be

removed to allow the center bud to develop. In the case of a "B" size dahlia the center bud should be pinched out and a side bud saved, since they usually open about five days sooner than "A" size dahlias.

All side laterals on the selected stalk should be removed while they are small to insure a nice clean stem for the show.

If the above directions are followed a good supply of blooms for the show should result.

PREPARING BLOOMS FOR THE SHOW

Preparing winning blooms for the show is not a last-minute operation, but rather begins even before planting. One must select varieties for planting that will have potentialities for fulfilling the requirements of the class or classes to be entered.

Show flowers should be well-grown, the foliage clean and unblemished, and the length of the stems in proportion to the size of the flowers. Timing the blooms to be at their peak at show time comes from experience. Some varieties mature in 25 days from a bud the size of a pea while others require 35 or more days. Some will continue to develop and hold up several days after they are in full bloom while others will sometimes drop their petals before the head is completely open.

Since dahlias are grown in the garden their development depends upon the weather and the moisture they receive during the finishing-off period previous to the show. Lack of moisture will retard the blooming; watering will speed up development. The use of dry chemical fertilizers is of no value in speeding up flowering during the last 30 days.

Cut blooms during the late afternoon or early morning. Remove the lower leaves, and the excess buds on the large varieties. Place the stems immediately in clean fresh water and set in a cool dark place until time to transport to show room.

Dahlias, especially the large varieties, are inclined to wilt after they are cut. The blooms are revived by either recutting the stems under water or by the use of the hot water treatment which is to place the stem in two inches of almost boiling water for two minutes, keeping blooms away from the steam. Following either method the blooms are placed in fresh cool water. I prefer the under water cutting to the hot water treatment. Care should be used in transporting the blooms to the show room.

Points for Keeping Cut Blooms

Cut only fully matured blooms; those with a few withered petals will keep longer under similar conditions than young blooms. Cut a longer stem than will be necessary in the vase or final container. Make the cut with a sharp knife so that the microscopic tubes in the stem, which supply water to the flower head, are not crushed. Flowers should be cut at least eight hours before it is planned to use them. As soon after cutting as possible, the stems should be placed in cool water in a cool basement. When putting the flowers in water trim off an inch or two of the stem under water. This cuts off the portion of the stem into which air

may have entered the microscopic tubes and choked off the supply of water passing up to the flower head. After hardening or finishing in the basement, the flowers may be used for their intended purposes. Each time the stem is out of water for more than a moment, it should be retrimmed under water.

—From the Dahlia Blue Book for 1957

To ship dahlias pack hardened off blooms in a corrugated box lined with tissue or wax paper. Pack blooms in both ends of the box, face up, with stems toward the center. Fasten stems down by nailing a wooden strip in the center of the box or by tying down through the bottom.

—Warren W. Maytrott in Dahliadel

INSECT AND DISEASE CONTROL

What a glorious life we gardeners would have if there were no insects to keep us busy. We would grow fat and lazy and could just sit under the apple tree and relax and watch our dahlias grow into fine big healthy plants with beautiful blooms. Oh there would be a little cultivating to do and some disbudding, but we could let Slim do that, some friend who does not want to get fat. But alas, this is not the case. We do have our insects and diseases to keep us on our toes; yet thanks to our chemists we are able to combat most of these problems and have the beautiful flowers we strive for.

About the time of the second world war we were attacked by an invasion of pavement ants. There were many of us whose dahlias were just about wiped out. Then DDT became available and the ant troubles were over. We now have Chlordane which also does a good job of controlling ants. However with the introduction of DDT we began to have trouble with Red Spider, sometimes called the two spotted Spidermite. The red spiders had been held in check by predators and parasites until DDT and other chlorinated hydrocarbons destroyed these natural enemies without harming their prey.

Red Spiders are very small and as a rule cannot be seen without a magnifying glass. The body is oval, yellow, or greenish with two dark spots on the back. In some strains the adults are red. The mites make fine webs on the undersides of the leaves and if not checked the web may entirely cover the buds, or blooms. They suck the plant juices and must be hit by a contact spray. Malathion and insecticides that contain Aramite give good control. In warm weather the red spider will reach the adult stage in five days and will build up enormous populations in a short time. Most sprays will not destroy the eggs, so plants must be sprayed every five or six days for at least four times to get all the mites after they have hatched.

Aphids (plant lice) are small, soft bodied sucking insects usually found in clusters on leaves or buds. They are common carriers of mosaic virus disease. Treat with contact sprays such as malathion, Lindane, or Black Leaf 40. (Pyrethrum extract or rotenone are also recommended. One thorough spray will do the trick; but it must be repeated when the aphids appear again.

CUCUMBER BEETLES eat holes in the petals of the flowers. A dust containing a large percentage of DDT blown into the face of the bloom daily will keep this pest under control and save the petals from damage that would ruin the bloom for exhibition. A very light dusting will suffice; heavy applications will leave a residue which will detract from the beauty of the flower and cost points in the judging.

EUROPEAN CORN BORER, or the Stem Borer, is a serious pest to the dahlia grower. It winters in old stalks of dahlias, corn or weeds. In the spring for a period of three or four weeks the female moth lays her eggs on the underside of leaves. The larvae hatch out in early June and start eating their way down into the stalks. As they grow the bore enlarges weakening the stem which finally breaks. You can see where the borers have entered the stalk by the sawdust left at the opening. DDT will control these pests, but only before they get into the stalk. Start spraying for them about the middle of May. Many times the upper branches will start to drop before the borer gets too far down and if you can find the hole where it entered you may reach it with a thin soft wire. Some say they can see the borer by putting a strong light on the opposite side of the stalk. You can cut them out, or pierce them with a thin knife blade.

GRASSHOPPERS have spoiled many prize blooms. They can be controlled to some extent with Chlordane. DDT works so slowly that the grasshopper can damage the flower before dying. Grasshoppers can be discouraged by spraying or dusting a wide area around the dahlia plot.

LEAFHOPPERS are small greenish-yellow, flying insects that suck the sap from the leaves causing them to turn yellow; eventually the lower leaves die. These pests are also vectors of many virus diseases. They are hard to hit with a contact spray but DDT will control them.

LEAFMINERS are insect larvae which feed between the two surfaces of the leaf. They are almost impossible to control after they are in the leaf. Treat with Lindane or DDT when the eggs are hatching.

THE TARNISHED PLANT BUG is about ¼ inch long, brown, irregularly mottled with yellow and black splotches. The adults puncture the stems and buds causing small black spots. Plant growth is retarded and buds open one-sided. DDT is the best control for this insect.

THRIPS are very small insects frequently found in open flowers, although both leaves and buds may become distorted. Control with weekly spraying of DDT.

MILDEW may appear if the weather is hot and humid especially if the plants are close together with poor air circulation. Dusting sulphur, fermate or captan check mildew if used as soon as the first signs appear.

STUNT, if not due to poor culture, ravaging by insects or rotting of feed roots, is probably due to a virus. Mosaic virus which is carried by aphids causes the leaves to be small and slightly crinkled. Ring Spot virus usually shows up on the lower leaves in the form of a circular light green

pattern with zig-zag edges. Thrips carry this virus. Plants known to have virus should be destroyed; however if the plant is merely stunted give it another chance the next year.

A good contact spray and a good stomach poison spray, plus a good fungicide will keep your patch clean. One should have a separate spray for red spider and keep after them.

WINTER STORAGE OF TUBEROUS ROOTS

Successful storage of roots begins at the time of digging. As soon as frost kills the plants the stalks should be cut off near the ground, cutting on a slant in order that the moisture can drain. At this time the clumps should have labels tied to them for identification. The mulch and old stalks should be cleared away so that the stalk stump that is left will dry out. I like to leave the roots in the ground a while to finish maturing and to harden up, the length of time depending on the weather. Naturally they must be dug before the ground freezes but the longer they are left in the ground the less time they will have to be in storage.

To dig roots use a round pointed shovel, cutting into the soil in a circle about eight inches or so from the stalk. Remove enough soil so that a cut can be made under the clump allowing it to be lifted out. Cutting the roots free at the bottom prevents breaking the tuberous roots from the crown of the stalk. Remove what soil you can, but leave enough to cover or protect the roots. Temporarily store them where they will not freeze, placing the clumps on one side so the moisture will drain out of the stub of the stalk and let them dry out slowly.

Years ago I tried digging, shaking off the soil and letting the roots dry in the sun for a few days, but I lost most of them by spring. I believe this quick change is too sever a shock and does not allow the roots to harden up for winter storage.

In a week or two the soil around the roots should be fairly dry. I then place them on some boards, a window screen or plastic cloth in the garden and wash the soil off them with a stream of water from the garden hose. The clumps are then cut or sawed in half, or if quite large, quartered. At this time all sections are marked by dampening the roots and writing the name and the year grown on them with an indelible pencil. I also trim off the old roots, feeder roots and part of the stalk, then dust cuts with a mixture of ½ dusting sulphur and ½ talc. After drying for three or four days they are packed in buckets, cartons or boxes (I like a five gallon size.) in layers with vermiculite packing. I use no lids for I believe this helps the moisture to adjust itself. Each container may be tagged with a list of the varieties it contains. Place the containers five or six inches off the floor in a cool dry storage place so that they will not become damp. The average temperature of the storage place should be above freezing but no higher than 55 or 60 degrees.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. spring to fall and until six in the winter time though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four, admission twenty-five cents, with special guides. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one most used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southhampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 A. M., but is closed on Saturdays, Sundays, and holidays. The step-in gate (more or less concealed by the big Cleveland Ave. gate, 2221 Tower Grove) is nearly always open, and there is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi which are at their best in April.